

A NEW GENUS AND SUBFAMILY OF NORTH AMERICAN HEPTAGENIIDAE (EPHEMEROPTERA)¹

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ABSTRACT—A new subfamily, genus and species of Heptageniidae (Ephemeroptera) is based upon larvae collected in Georgia, Wisconsin and Indiana. Descriptions of the larva of *Spinadis wallacei*, n. gen., n. sp., of the subfamily Spinadinae, n. subfam., are provided with notes on the biology.

In June, 1973, larvae of a remarkable new carnivorous Heptageniidae were discovered within a two-week period in Georgia and Wisconsin. In June, 1974, two additional larvae were discovered in Indiana (A. V. Provonsa and W. P. McCafferty, personal communication). The structure of the gills and the fact that the larvae were carnivores suggested that they might be assignable as a new genus in the subfamily Anepeorinae. However, the primitive shape of the head capsule and labrum, the fact that the terminal filament is apparently absent, and differences in the other mouthparts indicate that it is not closely related to *Anepeorus*. The larvae are, in fact, so distinctive that it was uncertain at first to what family they belonged. However, the incipient wing venation is clearly heptageniid. We therefore propose a new subfamily, Spinadinae, for this genus. When more larvae are available, details of the internal anatomy should allow it to be placed more precisely in the family. In addition, discovery of the adult and comparison with much needed adults of *Anepeorus* should further clarify the phylogenetic position.

A dorsal view illustration of a whole larva will be published by Edmunds, Jensen and Berner (in press). Drawings of gills, mouthparts and other structures are planned for a manuscript in preparation by Jensen and Edmunds.

Subfamily SPINADINAE, n. subfam.

Genus *Spinadis* Edmunds and Jensen, n. gen.

Mature larvae.—Lengths: body 9; caudal filaments 9 mm. Head capsule 1.1–1.2 times as wide as long; anterior margin evenly convex, without setae; lateral

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margins straight, without setae; posterior margin straight to concave medially, without setae. Eyes of female extending to postero-lateral angle; eyes of male extending beyond postero-lateral angle. Mouthparts adapted for predation. Left mandible with incisors serrate, well developed, subequal in length, outer incisor with 3 denticles, inner incisor with 5 or more small spines; lacinia consist of tuft of setae; molar region reduced to row of long setae. Right mandible similar in shape to left mandible. Maxillae with armature on galea-lacinia consisting of a row of setae, two large blade-like spines and a triad of spines at the apex; palpi long and slender, basal segment about $\frac{1}{2}$ as long as apical segment, sparsely setaceous. Labium with glossae about $2\frac{1}{2}$ times as long as wide; paraglossae about 2 times as long as wide; basal segment of palpi broad, about as wide as long; distal segment longer, about as wide as glossae and paraglossae; apical and lateral surfaces of paraglossae and labial palpi with numerous setae.

Pronotum widest near mid-length, lateral margins with few setae; posterior margin broadly and shallowly emarginate; a pair of prominent submedial tubercles near middle. Mesonotum with pair of prominent submedian tubercles in posterior $\frac{1}{3}$. Metanotum with pair of finger-like decumbent tubercles (erect in young larvae); weakly developed tubercle on posterior margin. Legs long and slender, about as long as body; fore legs with only scattered setae; posterior margin of femora with partial row of setae, apex of each femur with thumb-like apical projection; tibiae $1\frac{1}{3}$ times as long as femora; tarsi $\frac{1}{3}$ as long as femora; claws with small slender basal denticle.

Abdominal segments 1-9 with blunt postero-lateral projections and acute median tubercle on posterior margins. Gills on abdominal segment one inserted latero-ventrally; gills on segments 2-3 inserted ventrally, lamellae reduced to slender lanceolate structures, fibrilliform portion large; gills on segments 4-6 progressively less ventral, fibrilliform portion progressively smaller, lamellae progressively broader; gills on segment 7 inserted laterally, fibrilliform portion about $\frac{1}{3}$ as long as lamella, lamellae about $\frac{3}{4}$ as broad as long, about $1\frac{1}{2}$ times as long as tergum 7. Two caudal filaments with long setae on mesal sides in basal $\frac{3}{4}$; terminal filament vestigial.

Etymology.—An arbitrary combination of letters, suggested by the spiny larvae; feminine.

Type-species.—*Spinadis wallacei* Edmunds and Jensen, n. sp.

Spinadis wallacei Edmunds and Jensen, n. sp.

Mature larvae.—Lengths: body 9; caudal filaments 9 mm. General color: pale yellowish brown with darker medium brown markings. Head pale with medium to dark brown stripe extending to and across lateral edges of labrum; pair of more or less obsolescent brown stripes extending from near bases of antennae and meeting at midline near base of labrum (forming a dark V); pair of brown stripes on vertex, encompassing tubercles. Thorax light brown, postero-lateral areas darker brown; mesonotal scutellum medium brown with wide pale stripe at bases of wing pads, two-toned pale V-shaped area on mesonotum with lighter area mesally; mesonotal tubercles dark brown. Metanotum light yellowish brown. Legs light yellowish brown with medium brown to light fuscous markings; fore femora with broad dark band near mid-length, this band progressively more obsolescent on middle and hind legs; anterior edge with nar-

row dark stripe; apex of femora darker dorsally; tibiae with very broad dark band extending from near mid-length to $\frac{5}{8}$ length of segment; tarsi pale; claws pale basally, apical $\frac{2}{3}$ dark.

Abdominal terga brown, with pair of distinct submedian stripes on segments 1–8; lateral margins pale except for medium brown postero-lateral corners (in some young specimens the median area 3–4 and 8–9 are fuscous, much darker than other segments). Sterna 5–7 pale, with medium brown chevron-shaped mark formed by pair of stripes extending from near antero-lateral corner to midline of posterior margin; pair of darker submedian spots within this chevron-shaped mark; lateral of these are pair of diagonal streaks which extend anteriorly into pale areas; chevron-shaped mark progressively paler and less extensive on anterior segments, making segment one almost wholly pale, markings obsolescent on segments 2–3; segments 8–9 with chevron-shaped marks more extensive, merging with darker corners, making sterna wholly medium brown except pale antero-median triangle; sternum 10 mostly pale with medium brown lateral margins. Gill lamellae medium to dark brown in basal $\frac{2}{3}$, pale apically. Cerci pale with broad medium brown band near mid-length.

Holotype.—Nearly mature male larva, Georgia: Toombs Co., Altamaha Riv. at U. S. Hwy. 1, 5-VI-1973, B. Wallace, deposited University of Utah. Two Paratopotypes, same data. One Paratopotype, same locality, 2-V-1973 (Florida A and M University).

The four larvae from Wisconsin (Richland Co., Wisconsin Riv., 23-VI-1973, W. Flowers, two larvae, and same locality, W. L. Hilsenhoff, 2 larvae) are similar to those from Georgia. There are differences in the shape of the spines and in the intensity of the color pattern. They are either the same or a similar species. The extremely long legs of the larvae should be reflected in the legs of the adult. If the larval color pattern is carried over into the adult, they should be quite distinctive. We have not examined the Indiana specimens, but the drawing of the larva to be published will be made from one of the Indiana specimens.

The known biology of the genus *Spinadis* is scanty but all specimens were collected from large rivers in rather swift current. The Georgia specimens were all collected by drift nets in water over 10 feet deep. The Wisconsin specimens were taken from water about 5 feet deep after the river had dropped, and the Indiana specimens were collected from a log at a 2 foot depth in the White River. The unknown adults probably emerge in late June or early July.

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